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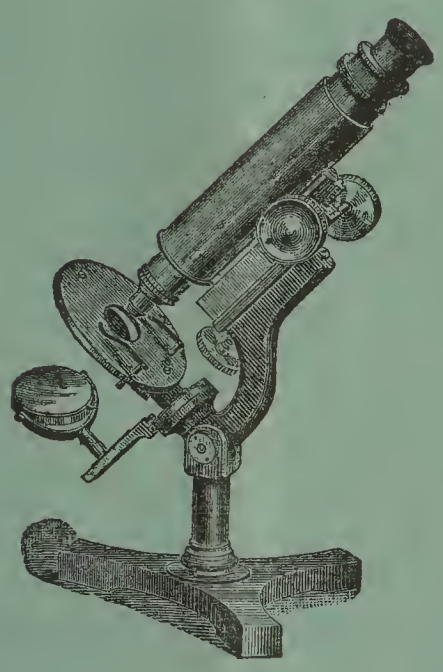
THE MICROSCOPICAL BULLETIN AND SCIENCE NEWS.



A BI-MONTHLY MAGAZINE,

EDITED BY

EDWARD PENNOCK.

JUNE, 1888.

Entered at Philadelphia Post-Office as second-class matter.

PUBLISHED BY

JAMES W. QUEEN & CO.,

924 CHESTNUT ST., PHILADELPHIA.

A New Laboratory Microscope.

(ACME No. 5.)

In designing this microscope we have discarded luxuries, retaining necessities. We have regarded solidity and thorough workmanship as prime features in a microscope intended for students' use, especially in laboratory work. The lenses (1 inch and $\frac{1}{5}$ inch) give a clearness of definition consonant with the mechanical construction of this microscope.

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FROM AN EMINENT HISTOLOGIST.

ITHACA, N. Y., March 1st, 1888.

The Acme No. 5 microscope [COPY.] sent for examination came duly and has been thoroughly examined by me and by representatives of the Departments of Botany and Entomology. We are all very much pleased with it. It seems to me that this is the best microscope for the price that I have ever seen.

(Signed) SIMON H. GAGE,
Histological Laboratory,
Cornell University.

WE WILL GIVE SPECIAL RATES FOR LABORATORIES AND SCHOOLS.

PRICE, IN CASE, $28.00.

Send for a copy of the MICROSCOPICAL BULLETIN (December number) containing description of this microscope and various other matters of interest to the worker, including a paper by Prof. John A. Ryder on "Celloidin-Paraffin Methods of Embedding," discussion of Prof. Minot's "Complaint," etc.

Send also for our **Catalogue of Microscopes**, 68th edition.

JAMES W. QUEEN & COMPANY,

Makers of the Acme Microscopes,
924 Chestnut St., Philadelphia.

THE MICROSCOPICAL BULLETIN
and
SCIENCE NEWS.

VOL. V. JUNE, 1888. No. 3.

Published Bi-Monthly by

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PRICE, PER YEAR, - - - 25 CTS.

☞ *Subscriptions begin with the year. Acknowledgments of receipt are made by sending the* BULLETIN.

The Determination of Magnifying Power.

A PREVALENT ERROR.

The method of determining magnifying power as taught in some of our medical schools, and as set forth in the extract given below from an excellent manual of histology recently published, is radically wrong, as may readily be demonstrated:

Place the micrometer on the stage of the microscope and focus the lines. Then place the rule also *on the stage* but just in front of and parallel with the micrometer. By a little practice, using both eyes, the two rulings may be seen simultaneously, etc.

In fact, the rule should be placed at a uniform distance of *ten inches from the eye*, regardless of the distance of the stage; ten inches, because that has been adopted as a convenient standard distance of distinct vision. Let us apply a simple practical test to the method as given above; for simplicity we will give approximate measurements only. We have, let us suppose, a one-fifth inch objective on a microscope having a tube five inches long, but extensible by draw-tube to ten inches. With a certain eye-piece, the actual field of view, as shown by the micrometer, may be twenty-five one-thousandths of an inch (.025); the apparent size of field measured by the rule placed on the stage, two and one-half inches (2.5); power, as given by this method, $\left(\frac{2.5}{.025}\right)$ one hundred diameters. Let us extend the draw-tubes to ten inches; every one will say, the power will be doubled; let us try it by the above method: The actual size of field will be twelve and a-half one-thousandths of an inch (.0125); the apparent size of field (the rule being on the stage as before) will now be five inches (5.), and the power, by the rule $\left(\frac{5.}{.0125}\right)$ four hundred!

Again, let us try the *reductio-ad-absurdum*, as follows: If we have, with the same ocular, a one-inch objective in one case, with draw-tube extended, and in another case a one-half inch objective with draw-tube closed, have we not obviously the same power? But by the rule, the one-inch objective would give double the power of the half-inch!

The matter simply reduces itself to this: A given eye-piece has a field of a certain apparent size, *i. e.*, its field covers a certain area on the retina of the eye, which is not affected in any way by the distance of the stage, but is constant whatever that distance may be.

American Society of Microscopists.

The President, Professor D. S. Kellicott, announces:

The next annual meeting of the Society will be held in Columbus, Ohio, beginning August 14th, and lasting four days. The Executive Committee has accepted the cordial invitation of the State Microscopical Society of Ohio to meet this year in Columbus, and it is earnestly hoped that the determination of both place and time for holding the eleventh meeting will be acceptable to the Society at large. Columbus is accessible, attractive, and a University city, one which affords all conveniences and facilities that can be desired for the entertainment of our Society. Thorough preparation will be made to receive all who may attend.

It may reasonably be expected that the members attending the coming reunion will exceed that of past years. There are more members

than ever before; the place of gathering is central; the American Association for the Advancement of Science meets the following week in Cleveland, Ohio, making it convenient for many who desire to attend both Conventions; and, moreover, there is manifestly a growing and abiding interest in the work of the Society. There is also some interest attached to the fact that this completes ten years of existence as an organization, and it is hoped that as many as possible of the forty-nine who took part in the initial meeting at Indianapolis will be present that they may be honored by the Society. * * *

A circular giving specific information regarding railway fares, hotel rates, etc., will be issued by the Secretary by the middle of July.

Error.

In ninth line, second column, page 16, Volume V, of MICROSCOPICAL BULLETIN, for 2.8 *mm.* read .28 *mm.*

Facts and Fancies.

A NEW EDITION of *Davis' Practical Microscopy* is "in press," but will not be ready for some months.

THE PUBLISHERS say regarding Carpenter's *Microscope and its Revelations*, that they "cannot say a new edition is on the road; one, however is in contemplation, but it will be twelve months before it is ready."

AN ENGLISH correspondent, H. Morland, writes favorably regarding the fine-adjustment, moving stage-plate, as adopted on the Acme No. 5 laboratory microscope. The plan of construction he recommends is quite correct, and had already claimed our attention.

THE PRINTER (we will not say the editor!) of a certain microscopical journal appears to think it quite proper that a professor of "etymology" (!) should cordially approve of the new Acme Laboratory Microscope. And why not, indeed!

R. N. REYNOLDS, of Detroit, after years of hard study, takes the degree of M. D.

DR. GEORGE M. STERNBERG lectured in Philadelphia in April last before the College of Physicians and Surgeons on the yellow fever in relation to its supposed bacterial origin. We understand that his investigations do not confirm Dr. Freire's claims of the specific "germ" of the disease. Dr. Sternberg advised us, near the end of April, that he was about starting for Havana to continue his investigations. His address may be found in the *Medical News.*

IN THE January number of the *Annals of Hygiene* is published an account of the admirable arrangement for disinfecting vessels at the Quarantine Station below New Orleans, by Dr. Joseph Holt, late President of the State Board of Health of Louisiana. These arrangements appear to be very thorough and in accord with the results of recent investigations on infectious diseases. They are the result of much labor, invention, and experiment on the part of the Board, made necessary by the recent great advances in our knowledge of infectious diseases attained by the study of bacteriology.

IN A PAPER on "the pathology of pollen in æstivis or hay-fever," in the *Journal of the New York Microscopical Society* for April, Dr. Samuel Lockwood sums up as follows:

Thus have been instanced four possible modes of action for pollen in hay-fever:

1. Its suffocating effect as an impurity of the atmosphere, thus exciting asthma.
2. As a mechanical irritant, begetting inflammation, even to excoriation of the mucous membrane.
3. As a toxic agent, poisoning the tissues.
4. As a pseudo-parasite, penetrating the soft and sensitive parts.

It should be added that these activities are here supposed to operate upon the system while in an abnormal state—in a word, behind all there is a hay-fever neurosis.

A CORRESPONDENT, Hans M. Wilder, says: "I see from one of the pharmaceutical journals that a German microscopist recommends Tupelo wood (Nyssa candicans Michx, etc.), for use in section-cutting, which grows in the Southern United States not far from the seacoast. It is stated to be superior in several respects to elder pith, sunflower pith, and cork. In hardness the wood is intermediate between elder pith and cork."

[Gray says, regarding Nyssa uniflora (probably synonymous with the above), "Wood soft; that of the roots very light and spongy; used for corks." He says it is found "in water or wet swamps—Virginia, Kentucky, and southward."—ED. M. B.]

IN THE *Journal of the New York Microscopical Society* for April, Dr. D. H. Briggs has a noteworthy paper on the preparation of "beautiful micro-polariscope objects." He gives his process for preparing slides of hippuric acid as follows:

Of this substance a concentrated but not saturated solution in hot, absolute alcohol is prepared in the little flask; the glass slip heated over the lamp; the hot solution poured on the end of the slip. and flowed over the centre, with some ebullition, and immediately run off into the flask. Wait a few seconds until the rosettes begin to from on the slide. and then quickly place on the cold iron, until the slide is cool. Now examine with the microscope, when presently the rosettes will begin to radiate a fringe around their circumference This can be accelerated by allowing the breath to come in contact with the slip. When the discs are nearly of the size desired, the process will be stopped, or rather changed in character, by slightly warming over the lamp for one or two seconds, and then cooling, and proceeding as

before, if further developments are desired. When the crystals cover the surface seal on the thin glass cover.

If properly prepared, these slides are very vivid in color in the polariscope, and exhibit also very pleasing forms.

We have obtained from Dr. Briggs some of these beautiful crystallizations of various substances, and can highly commend them to the attention of our readers. They are unexcelled by any which come under our notice. Price, sixty cents each.

Acknowledgments.

V. A. LATHAM, Ann Arbor, Mich.—Copy of daily paper with article on Professor Gibbes' work at the University of Michigan. JAMES B. SHEARER, Bay City, Mich.—A beautiful photo-micrograph of a leaf section. DR. W. M. GRAY, Washington, D. C.—Several most admirable photo-micrographs of animal tissues. C. E. HANAMAN, Troy, N. Y., THOMAS B. BRIGGS, New York city, and C. C. MELLOR, Pittsburgh, Pa.—Catalogues of objects shown at various microscopical entertainments given by the different local societies.

Practical Utility of the Microscope to Textile Workers.

[WRITTEN FOR THE MICROSCOPICAL BULLETIN.]

A question arising as to whether a large lot of yarn delivered at our mill equaled in quality the sample lot on which we based the order, we made our tests as follows: In lot No. 1, fifty fibres averaged, under microscope, one twelve hundred and sixty-fifth inch in diameter. In lot 2, fifty fibres averaged one twelve hundred and sixtieth inch in diameter. Of lot 1, thirty-six fibres, and of lot 2, thirty five fibres, ranged in diameter between and including one-fifteen hundredth and one twelve hundredth inch, showing a most remarkably close approach in quality of large delivery to sample order.

Sixteen loose outside fibres from a two ply No. 40 worsted yarn averaged one eight hundred and thirty-third inch in diameter, while ten ditto from a two-ply No. 28 worsted yarn averaged one eight hundred and thirty third ditto. Both yarns were from one spinner and both (as was afterward discovered) made of three eighths blood wool, which fact explains the exact correspondence in diameter as above.

Our efforts in this line have been few and feeble as compared with those made by the superintendent of one of the largest mills in New England. He uses the camera lucida for microscopic measurement of fibres by a method effecting great saving of time and eyesight. His mill sorts wool into eight different sorts, and he states a good sorter has no difficulty in determining one quality from another wherein the difference as between two sorts is measured by less than one thousandth inch in average diameter of fibres, which fact he has determined with the microscope. A large establishment, giving him a sample of foreign cloth to duplicate, he ascertained by the microscope camera-lucida method the quality of wool in both warp and weft threads, and knowing from previous records the measurements of his own mill's sortings of wool, was thus enabled to pick out from stock on hand what would give when worked up a practical duplicate of the foreign fabric.

The condition as to health or disease in wool fibres, the freedom from or appearance of previous manipulation (as in shoddy yarns), the lumpiness apt to prevail in yarns constituted largely of noils (fine waste stock), the adulteration of yarns by the smuggling of cheaper materials into wool, silk, etc. (our microscope led to detection of fifteen per cent. cotton in a so thought worsted yarn), the source of foreign matters found on face of cloth as discovered when dyed, whether cotton off the spinning machinery or flax from the twine of the wool-sacks or grasses from the sheep pastures—all these are matters largely determinable through use of the microscope, which we believe will be more and more generally employed in textile industries as competition becomes intense and general culture advances.

As to the use of the microscope on made-up goods—this is microscopy in the gross, and is, I fancy, mainly confined to thread-counting. Consult some maker of fine cassimeres. A woman with a fifty-cent thread counter can, I take it, distinguish much better as to the quality of two pieces of muslin or linen by simply counting the threads to the quarter inch than she could by feel or naked eye.

American Postal Microscopical Club.

EXTRACTS FROM THE NOTE-BOOKS.

GLYCERINE MOUNTING.—I think it necessary to poison the glycerine in which to mount, and use corrosive sublimate for this purpose. This slide shows the effect of too much sublimate. The crystals I suppose to be an organic compound, for the medium was perfectly clear for several months after sealing. Hunt's white zinc is useful for filling around the cover. It is made of gum dammar dissolved in purified turpentine to a thick varnish, to which is added white zinc obtained from dealers in artists' material and sold in tubes. This I understand to be the oxide of zinc ground in poppy oil.—L. BREWER HALL.

As an additional caution I add a little solution of rubber. It cannot be used next the glycerine with safety. I think it quite unnecessary to poison glycerine. It rapidly kills all vegetable life when pure and properly sealed. Dilute glycerine is unsafe.—S. G. SHANKS.

STAINING FLUIDS.—I have taken a number of photos of this slide and fail to get good results. It should photograph well but does not. —H. L. B.

The faint eosin stain will give but little pho-

tographic differentiation. The specimen would have been greatly improved with hæmatoxylin stain.—M. N. M.

Eosin is a poor stain when used alone. These sections would have been much better if stained with hæmatoxylin and eosin, or carmine alone. Young fœtal tissues, especially human, take staining very poorly. Hæmatoxylin is by far the most selective stain that I have used.—S. G. S.

There is a little picro-carmine in the market that is good. Ammonia carmine or hæmatoxylin is better for staining purposes.*—* * *

MOUNTING STARCHES.—Use select white gum arabic, 2 oz.; glycerine and cinnamon water, each 1½ fluid oz. Shake occasionally until dissolved (about two weeks), and strain without pressure through thin old muslin —A. P. BROWN.

Distilled water will answer perfectly for the above by adding a crystal of thymol when completed. May be made by the formula, or thinner, and afterward evaporated sufficiently. "Farrant's Medium," which is much thicker than the above modification, may be made in three or four days.—C. M. V.

FARRANT'S MEDIUM.—This medium remains soft under the cover-glass. The gum arabic hardens at the edges, requiring no sealing if for temporary use, and being easily sealed at any time. After some years the gum sometimes becomes granular and gives a cloudy appearance. Some makers mix glycerine, distilled water, and a saturated solution of arsenious acid, equal parts, adding one-half its bulk of picked acacia, and filtering after it has stood two or three weeks. It remains too soft if too much glycerine be used. Soon becomes cloudy if too much gum, and also from arsenic. — ALBERT P. BROWN.

The medium hardens at the edges in three to ten hours, is superior to balsam or dammar for any transparent objects, and deserves to be more extensively used.—C. M. VORCE.

TINFOIL CELLS.—These are extremely useful and may be had of almost any desired thickness up to that of sheet lead. A cheap die for cutting cells can be made of three or four thicknesses of "telescoping tubing," which can be had from the tube-drawers. The tubes when fitted are to be cut into two lengths and "faced off" square and smoothly, the outermost tube being left longer than the others. By putting a piece of foil on the square ends of one set, and opposing to it the squared ends of the other set, then forcing over all the outer tube, a disk will be cut off; then by pushing through each alternate tube of the set a series of rings will be cut out.—C. M. VORCE.

ANTIPYRIN.—This slide is not inserted for the elegance of its mounting, but to give members of the club an opportunity to see the beauty of this substance, which is a medicine that may be found in most drug stores. I have not as yet succeeded in making a regular mount equal to this in beauty, but am sure I shall, as it is only a question of the density of the solution.—THOS. ANTISELL.

* Picro-carmine in solution will never keep. Queen & Co. now furnish it in powder, which may be dissolved as required for use.

Weigert's Hæmatoxylin Staining for Medullated Nerve Tissue.

FORMULÆ.

(1) A saturated aqueous solution of neutral acetate of copper.

(2) Strong hæmatoxylin staining fluid, *vide* text. (*Given below.*)

(3) Borax, ferridcyanide of potassium; 1 drachm water—4 fluid ounces.

PROCESS.

1. Allow the sections to remain in 1 for twenty-four hours.

2. Wash in clear water for a few moments only, and transfer to 2. Brain sections will require from two to three days, and spinal cord twenty-four hours for complete staining. They must appear almost black. If the hardening has been effected with the bichromate solution as given in the text (*vide* hardening fluids) maceration of the sections in the cupric acetate may be omitted.

3. Wash in water for five minutes and transfer to 3. They may be allowed to remain for twelve hours without harm.

4. Wash in water.

5. Dehydrate gradually, first placing in dilute alcohol and afterward in stronger. The sections can now be kept in alcohol indefinitely. If the tissue has been infiltrated with celloidin, the sections must not be held in ninety-five per cent. alcohol longer than five minutes, as the infiltrating medium will be dissolved.

6. Clarify with oil of cloves—oil of bergamot for celloidin specimens—and mount in dammar.

The method does not produce bright colors, but it gives a very remarkable differentiation of nerve tissue by staining the medullary substance violet and the axis cylinders brown. It is particularly valuable in pathological histology.

HÆMATOXYLIN STAINING FLUID.

To about eight fluid ounces of a hot, saturated aqueous solution of common alum contained in a porcelain capsule, add, a few grains at a time, one drachm of hæmatoxylin with constant stirring. Boil over the spirit lamp very slowly for fifteen minutes. Add sufficient water to compensate for evaporation, and when cold pour into a wide-mouthed bottle. Throw in a piece of camphor, say thirty grains; allow the whole to remain exposed to the air for one week, and then filter.

The solution should always be filtered before using. Keep the filter paper in a funnel and use it as a stopper for the bottle. The dye improves in strength of color for two or three weeks.

Should the solution, which is of a beautiful purple or violet color, at any time turn red, a small piece of common chalk may be added. This will restore the color by neutralizing the acidity. A few crystals of alum should always be kept in the bottle to insure saturation.

Prepared as above, the dye will keep perfectly for at least eight months, and gives a permanent stain.—*Miller's Histology.*

Items from the Botanical Gazette.

Dr. William Trelease will sail for Europe early in June.

A. A. Crozier, assistant botanist to the U. S. Department of Agriculture, has been appointed botanist to the State experiment station at Ames, Iowa, and has already entered upon his duties.

Dr. J. C. Arthur sails from New York May 16th, and intends visiting the principal universities and experiment stations in England, Holland, and Germany, returning in time for the A. A. A. S. meeting in Cleveland.

Botany is strongly represented in the organization of the Tennessee experiment station. Professor F. Lamson Scribner, at present chief of the section of vegetable pathology of the U. S. Department of Agriculture, is placed in charge of botany and horticulture, and also made professor in the university. W. E. Stone, now studying at the University of Göttingen, and well known to our readers as a contributor of articles on physiological botany, is made chemist; and Professor C. S. Plumb, of the University, and editor of *Agricultural Science*, who has made practical studies of cultivated plants and their diseases, is assistant director.

Raising of Bread Dough.

Carl Dünnenberger has published* an account of his critical researches upon the lightening of bread dough. The paper is a long and able one. His most important result is the showing that "the normal fermentation of bread is alcoholic, whether one uses yeast or leaven† to render it porous." The only essential ferment organism is the yeast. Maltose, the substance fermented, is produced from a part of the starch of the flour by the action of a diastatic enzyme, *cerealin*. Bacteria are, as far as normal bread-fermentation is concerned, an impurity, and are absolutely unnecessary. The raising of bread dough depends, in the first place, upon the carbonic acid set free by the alcoholic fermentation. Afterward, there is, in consequence of the temperature of the oven, an expansion of or volatilization of various substances which assist the raising action, namely, air, alcohol, water, and (in an accessory, subordinate way) the volatile fatty acids formed by bacteria." Wigand's Bacterium farinaceum and Laurent's Bacillus panificans are thus thrown overboard, as far as their physiological action is concerned, and our light breads, whether by "salt-rising" or "Fleischmann's," depend on some budding saccharomycete.—*Botanical Gazette.*

*Bot. Centralblatt, no. 8, 1888, p. 245 et nn. seq: Bacteriologisch-chemische Untersuchungen über die beim Aufgehen des brotteiges wirkenden Ursachen.

† *I. e.*, dough left from one baking to another, either with or without the addition of an extract of hops or malt.

Photo-Micrography.

From an illustrated article on this subject in *Science of Photography*,* by Dr. W. M. Gray, of the Army Medical Museum at Washington, we make the following extract, which will doubtless prove of interest to our readers:

The art of photo-micrography is of comparatively recent origin, yet, considering its scientific importance, it seems unfortunate it has not kept pace with the advances made in general photography. The value of the photo-micrograph as a means of illustrating scientific papers has never been disputed, but the possibility of producing successful pictures of difficult subjects has been doubted. In this article it will be the purpose of the writer to give a description of the methods and the apparatus employed by him in producing a series of photo-micrographs of subjects connected with general medicine, consisting of sections of general histological and pathological subjects and bacteriology.

A monocular microscope, with one or two objectives, a camera with its plate holder, and some form of illuminating apparatus are the only instruments absolutely necessary for photo-micrographic work. The stand of the microscope should be very steady, the movement of the coarse adjustment smooth and regular, and the fine adjustment as fine as possible. It is essential that the body of the microscope should admit of being placed in a horizontal position, and there should be some arrangement for stopping and retaining it in this position. An inner tube (draw tube) is desirable, and this should be provided at its lower end with the society screw for holding an amplifier, and also for carrying a low power objective, as the working distance on most stands is insufficient to permit of a very low-power objective being used. The head of the fine adjustment screw should be grooved round the margin for the purpose of carrying a cord, which will be required in focusing on the camera screen. A mechanical stage is a great convenience, although not absolutely a necessary adjunct, but in its absence it is important that the hand movement be very smooth and steady, as objects often require to be carefully centered for photography, and when a good field has been found it is very annoying to lose it in an attempt to move the slide a trifle one way or the other. For high-powers the sub stage should possess an arrangement for carrying a condenser,

*A new monthly photographic journal, published by James W. Queen & Co., at $1.00 per year; each number contains 24 pages (exclusive of advertisements), illustrated. Those of our readers who are interested in photography should send for sample copy.

and should be capable of being focused forward and backward. As a condenser, an ordinary one-fifth-inch objective may be used. The choice of objectives will be left to individual taste, the field is such a large one that the writer will not promote discussion by recommending any of specified manufacture. Beginners are advised at the outset to make their first efforts with such objectives as they may possess, and to remember that the most expensive objectives are not necessarily the best for their purpose. For the larger part of the work in photographing sections comparatively low-powers will be found most satisfactory, powers ranging from fifty to three hundred diameters. These amplifications may be obtained with objectives from three-inch to one-fifth-inch focus, but where it is desired to obtain a very high amplification, as, for instance, in bacteriology, it will be found necessary to use one of the modern homogeneous immersion objectives.

Contrary to usual directions, it is the writer's experience in getting any desired amplification that it is better to use the *highest* objective that will give the desired power, without forcing the lens either by placing the camera screen at a great distance or by using an eye-piece, or amplifier. According to the old argument, the *lowest* power possible is advocated in order to gain penetration, but when we consider the improved modern methods of preparing sections of tissues the fallacy of this argument is obvious. Therefore, in order to obtain a desired definition, instead of using a one-inch objective, with the camera screen at six feet, use a one half-inch objective with the camera at three feet.

When it is an advantage to increase any given amplification by the use of an eye-piece, or amplifier, the writer would advise the use of one of the modern Zeiss projection eye-pieces. This is constructed especially for photographic work, is made of the new apochromatic objective glass, and gives a perfectly flat field, with comparatively little loss of light, and the cost is trifling.

The camera should be of good construction, and should have at least two plate holders, one for the wet plate process, another for the dry. The plate holders should possess different sized kits, ranging from quarter size, $3\frac{1}{4}$x$4\frac{1}{2}$, to at least $6\frac{1}{2}$x$8\frac{1}{2}$ inches As a matter of economy the beginner is advised to use only the smallest plates, until he becomes sufficiently expert to insure a first-class negative. This warning would of course only apply to the use of dry plates, as the element of cost in the use of the wet plate is trifling.

In the place of the ordinary ground glass of the camera an under-exposed dry plate should be used. To prepare this focusing screen, place a slow dry plate in the holder, slightly underexpose it, and then develop, fix and wash in the usual way. After the plate has become dry place it in back of camera with the film surface toward the front. This focusing screen will give a smooth, fine surface on which the finest cell may be distinctly seen, and on which a focusing glass may be used with advantage.

The arrangement of the camera and microscope will depend entirely upon whether the operator has the advantage of the use of a room that can be devoted exclusively to photo-micrography. When such is the case, matters are very much simplified by making this room the camera, inside of which the operator works. A room to be used for this purpose must have a southern exposure, and should be darkened and rendered non-actinic in the same manner as an ordinary dark room, in fact, it may be used as the dark room. The microscope must be fastened to a shelf on the inside of a window facing south, and should be placed as far as possible to the left, in order to leave room on the right for a shutter through which the operator leans to adjust either the heliostat or reflecting mirror. The camera or frame for the plate holder is placed on a stand back of the microscope, with the centre of the focusing screen on a level with the axis of the microscope when the instrument is in a horizontal position. These directions are applicable only when sunlight is to be used as the illuminant. When lamplight or electricity is used for illumination the space between the camera and the microscope must be closed. When it is the intention to work in this way, the simplest plan is to fasten the camera and microscope to a board, the length and breadth of which will be governed by the size of the camera. The connection between the camera and the microscope must be light-tight, and may be constructed of cardboard, blackened on the inside.

Some appliance will be found necessary for focusing the image on the screen by the fine adjustment, and no better one can be used than an ordinary fishing line weighted at the ends with lead, and arranged as shown in the diagrams.

Thin Sections.

C. H. Stowell.

It will be a fortunate day for all workers when they see the editorial in the May number of this journal on the proper thickness of microscopical sections.

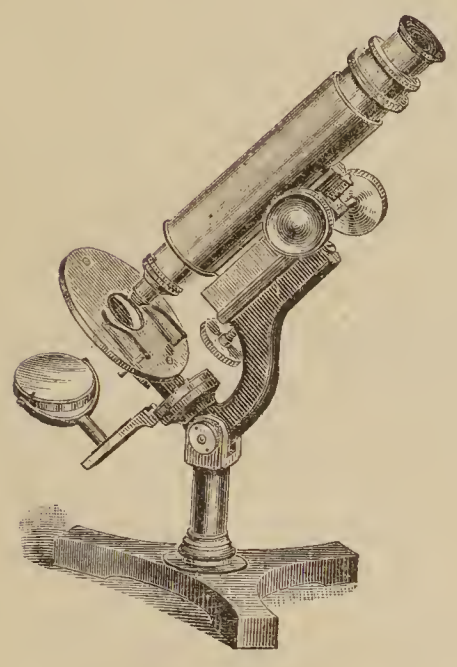
The first question we used to hear asked about a microscope was, How much does it magnify? but now it is, What will it show?

Here is a great advance, surely. We do not care to have an object look large simply for the sake of seeing a large object. Workers have awakened to the fact that the enormous "Centennial" and "International" stands are not absolutely necessary for good resolution. They appear to have most value when exhibited to an astonished jury as a most wonderful instrument, "with which one can tell the blood of a woman from that of a man."

But it is to be feared we are not making advance on the question of section cutting. A recent writer says that all sections should be only as thick as a single layer of its elements; meaning, we should take it, that the thickness

To Physicians!

THE ACME No. 3 MICROSCOPE



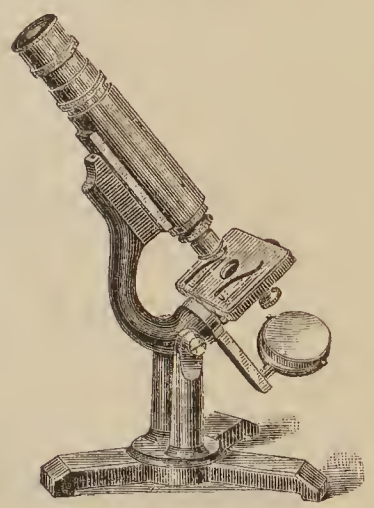
is adapted for finest work in Bacteriology, etc., as well as for ordinary daily use in urinary analysis. With $\frac{3}{4}$ inch and 1-5 inch objectives, 2 eye-pieces (power 50 to 700), glass slides and covers, in case, $83.00.

With same outfit, but with addition of the 1-15 inch oil immersion objective and substage condenser, (power 50 to 1,600), $150.00.

THE ACME No. 4 MICROSCOPE

is pre-eminently the practicing physician's microscope, having lenses of such power and quality as will clearly show the diagnostic test of consumption (Bac. tuberculosis), and amply efficient for urinary analysis, etc.

With 1 in. and 1-5 in. objectives, 2 eye-pieces (power 40 to 600), glass slides and covers, in case, $55.00.



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January 10th, 1888.